CLAIMS

What is claimed is:

~~1. The idea of sharing a phone line (twisted pair) with more than one customer.~~

~~2. The idea of assigning lines to DSL customers in the network, independently of lines assigned to the POTS service of the corresponding customers.~~

~~3. Using the idea of claim 1 to increase the number of available lines for the customers of fat-pipe technology.~~

~~4. Using the ideas of claim 1 and claim 2 to improve the performance of the DSL network by reducing the effect of crosscoupling noise in the network and increasing the SNR of the DSL services.~~

~~5. Using the idea of claim 1 and claim 2 to solve any given optimization problem, such as the problem of minimizing the weighted sum of the energy of the crosscoupling between lines in the network or any other performance index, by finding the telephone lines that have minimum interaction with each other in the network and assigning them to the DSL services.~~

~~6. Using the optimization problem of claim 5 to improve SNR of the network or data transmission rate of the network.~~

~~7. Using the idea of claim 5 and 6 to prioritize different customers by assigning proper weighting function to different customers in the performance index.~~

~~8. Using the idea of claim 1 and claim 2 and simplifying the optimization problem of claim 5, by searching between a subset of available lines, instead of all available lines, for assigning to DSL service.~~

9. The method of claim 8 can be implemented, by identifying a subset of lines which have relatively weak interaction.

10. Identifying a subset of weakly interacting lines in claim 9 can be accomplished via direct measurement such as using a spectrum analyzer, or any identification procedure.

11. Using the idea of claim 1 and claim 2 to solve the optimization problem by taking the crosscoupling strength between all lines and the DSL service type of each customer into account.

12. Using the idea of claim 1 and claim 2 to solve the optimization problem of claim 5 in a general way and independently of the service type of each customer by finding the lines with minimum crosscoupling norm.

13. The idea of claim 1 and 2 can be implemented by using the bridged taps, which exist at different locations throughout the line.

14. The idea of claim 1 and claim 2 can be used to assign one line to more than two customers, if the line is known to have small interaction with other lines at specific bridged tap locations throughout the line.

15. The idea of claim 1, claim 2 and claim 14 can be applied to one POTS customer and multiple DSL customers with distinct data frequency band.

16. Using the idea of claim 14, if a line is assigned to multiple customers, the ones who are closer to the CO will receive a faster DSL service.

17. The ideas of claim 1, claim 2 and claim 14 can be implemented by using proper filters (low pass, band pass and high pass) to each customer sharing a line, to allow only a specific frequency band being delivered to each customer for a secure signal transmission.

~~18. The ideas of claim 4, 5, 9, 10, 11, 12, 14 can be used for near end crosstalk (NEXT), or far end crosstalk (FEXT) of lines, the effect of NEXT, however is normally dominant.~~

19. A method of improving the performance of an Internet network, the Internet network including a plurality of communication lines X, Y, Z, and *N*, such communication lines being linked so as to permit bandwidth sharing between more than one customer, the method comprising the step of:

selectively associating communication line X with one or more of communication lines Y, Z, or *N*, such selective association being based on associating particular communication lines between which the effects of crosstalk are relatively small, thereby improving the performance of Internet network access made available to a customer associated with communication line X.

20. The method of claim 19, whereby the Internet network is operable to provide Digital Subscriber Line (DSL) service to one or more of communication lines X and/or communication lines Y, Z, and *N* independently of the communication lines assigned for the Plain Old Telephone Service (POTS) to the customers associated with the communication lines.

21. The method claimed in claim 20, whereby the performance of the DSL service is improved by reducing the effect of crosstalk noise affecting the one or more communication lines assigned to the DSL service, and by increasing the signal to noise ratio of the DSL service.

22. The method of claim 20, comprising the further step of optimizing the allocation of the communication lines for DSL service provided to a plurality of customers by minimizing the weighted sum of the energy of the crosstalk between the communication lines and the associated plurality of customers.

23. The method of claim 22, comprising the further step of determining a subset of communication lines and associated customers and then optimizing the allocation of communication lines for DSL service between such subset of communication lines.

24. The method of claim 19, comprising the further step of initiating a measurement procedure for detecting communication lines with relatively small crosstalk interaction therebetween, by utilizing a measurement device such as a spectrum analyzer.

25. The method of claim 24, whereby the measurement procedure is implemented using one or more bridge taps linked to the communication lines.

26. The method of claim 22, whereby the optimizing of the allocation of the communication lines for DSL service is achieved by applying a weighting matrix to prioritize different DSL customers.

27. The method of claim 19, whereby one of the communication lines can be assigned to more than two customers if a particular one of the communication lines is known to have a relatively small crosstalk interaction with other communication lines associated with the particular one of the communication lines at a particular bridge tap location.

28. The method of claim 19, comprising the further step of associating filter devices (low-pass, band-pass and high-pass devices) with each communication line being shared so that only a specific frequency band is carried on the communication line for a particular customer thereby providing secure signal transmission.

29. The method of claim 22, whereby optimizing of the allocation of communication lines for DSL service is used to minimize the effects of near end crosstalk (NEXT) and/or far end crosstalk (FEXT) of the communication lines.

30. A system for improving the performance of an Internet network that includes a plurality of communication lines X, Y, Z, and *N*, such communication lines being linked so as to permit bandwidth sharing between more than one customer, the system comprising:

a bridge tap means linked to the plurality of communication lines X, Y, Z, and *N*, the bridge tap means being operable to permit communication line X to be selectively associated with one or more of communication lines Y, Z, or *N* by associating particular communication lines between which the effects of crosstalk are relatively small, wherein the bridge tap means is operable based on such selective association to improve the performance of the Internet access made available via communication line X.

31. The system as claimed in claim 30, the system further comprising at least one filter device (low-pass, band-pass or high-pass filter devices) linked to each communication line being shared so that only a specific frequency band is carried on the communication line for a particular customer thereby providing secure signal transmission.

32. An Internet network including a plurality of communication lines X, Y, Z, and *N*, the Internet network comprising:

(a) a bridge tap means linked to the plurality of communication lines X, Y, Z, and *N*, the bridge tap means being operable to permit communication line X to be selectively associated with one or more of communication lines Y, Z, or *N*, by selectively associating particular communication lines between which the effects of crosstalk are relatively small, wherein the bridge tap means is operable based on such selective association to improve the performance of the Internet access made available via communication line X; and

(b) at least one filter device (low-pass, band-pass or high-pass filter devices) linked to each communication line being shared so that only a specific frequency band is carried on the communication line for a particular customer thereby providing secure signal transmission

CLAIMS

What is claimed is:

19. (New) A method of improving the performance of an Internet network, the Internet network including a plurality of communication lines X, Y, Z, and *N*, such communication lines being linked so as to permit bandwidth sharing between more than one customer, the method comprising the step of:

selectively associating communication line X with one or more of communication lines Y, Z, or *N*, such selective association being based on associating particular communication lines between which the effects of crosstalk are relatively small, thereby improving the performance of Internet network access made available to a customer associated with communication line X.

20. (New) The method of claim 19, whereby the Internet network is operable to provide Digital Subscriber Line (DSL) service to one or more of communication lines X and/or communication lines Y, Z, and *N* independently of the communication lines assigned for the Plain Old Telephone Service (POTS) to the customers associated with the communication lines.

21. (New) The method claimed in claim 20, whereby the performance of the DSL service is improved by reducing the effect of crosstalk noise affecting the one or more communication lines assigned to the DSL service, and by increasing the signal to noise ratio of the DSL service.

22. (New) The method of claim 20, comprising the further step of optimizing the allocation of the communication lines for DSL service provided to a plurality of customers by minimizing the weighted sum of the energy of the crosstalk between the communication lines and the associated plurality of customers.

23. (New) The method of claim 22, comprising the further step of determining a subset of communication lines and associated customers and then optimizing the allocation of communication lines for DSL service between such subset of communication lines.

24. (New) The method of claim 19, comprising the further step of initiating a measurement procedure for detecting communication lines with relatively small crosstalk interaction therebetween, by utilizing a measurement device such as a spectrum analyzer.

25. (New) The method of claim 24, whereby the measurement procedure is implemented using one or more bridge taps linked to the communication lines.

26. (New) The method of claim 22, whereby the optimizing of the allocation of the communication lines for DSL service is achieved by applying a weighting matrix to prioritize different DSL customers.

27. (New) The method of claim 19, whereby one of the communication lines can be assigned to more than two customers if a particular one of the communication lines is known to have a relatively small crosstalk interaction with other communication lines associated with the particular one of the communication lines at a particular bridge tap location.

28. (New) The method of claim 19, comprising the further step of associating filter devices (low-pass, band-pass and high-pass devices) with each communication line being shared so that only a specific frequency band is carried on the communication line for a particular customer thereby providing secure signal transmission.

29. (New) The method of claim 22, whereby optimizing of the allocation of communication lines for DSL service is used to minimize the effects of near end crosstalk (NEXT) and/or far end crosstalk (FEXT) of the communication lines.

30. (New) A system for improving the performance of an Internet network that includes a plurality of communication lines X, Y, Z, and *N*, such communication lines being linked so as to permit bandwidth sharing between more than one customer, the system comprising:

a bridge tap means linked to the plurality of communication lines X, Y, Z, and *N*, the bridge tap means being operable to permit communication line X to be selectively associated with one or more of communication lines Y, Z, or *N* by associating

particular communication lines between which the effects of crosstalk are relatively small, wherein the bridge tap means is operable based on such selective association to improve the performance of the Internet access made available via communication line X.

31. (New) The system as claimed in claim 30, the system further comprising at least one filter device (low-pass, band-pass or high-pass filter devices) linked to each communication line being shared so that only a specific frequency band is carried on the communication line for a particular customer thereby providing secure signal transmission.

32. (New) An Internet network including a plurality of communication lines X, Y, Z, and *N*, the Internet network comprising:

(a) a bridge tap means linked to the plurality of communication lines X, Y, Z, and *N*, the bridge tap means being operable to permit communication line X to be selectively associated with one or more of communication lines Y, Z, or *N*, by selectively associating particular communication lines between which the effects of crosstalk are relatively small, wherein the bridge tap means is operable based on such selective association to improve the performance of the Internet access made available via communication line X; and

(b) at least one filter device (low-pass, band-pass or high-pass filter devices) linked to each communication line being shared so that only a specific frequency band is carried on the communication line for a particular customer thereby providing secure signal transmission